The coroner arrived at midnight and found the victim's body temperature was 56.49°F. Three hours later the temp. was 37.20°F.

(a) If the body temp. decreases exponentially, write a function for the body temp. with respect to time.

what you have after x-time → $y = ab^{x}$ (x → time; a → initial; b → growth rate)

$$\frac{56.49\,b^3}{56.49} = \frac{37.20}{56.49}$$

$b^3 = 0.6585$

$b = 0.87$

$$\boxed{f(x) = 56.49(0.87)^x}$$

(b) Approximately what time did the victim die?
(i.e. what time was the body temp. 98.6°F?)

$$\frac{98.6}{56.49} = \frac{56.49(0.87)^x}{56.49}$$

$\log 1.745 = \log 0.87^x$

$\log 1.745 = \log(0.87)\,x$

$$x = \frac{\log 1.745}{\log 0.87} \approx -4$$

when → 8 pm

Logarithm Properties

1. $\log_a 1 = 0$ b/c $a^0 = 1$

2. $\log_a a = 1$ b/c $a^1 = a$

3. $\log_a a^x = x$ and $a^{\log_a x} = x$ (inverse)

4. If $\log_a x = \log_a y$ then $x = y$

Same for $\ln = \log_e$

Problems

1. $\log(2) + \log(5) = \log(2\cdot 5) = \log(10) = 1$

2. $\log(2) + \log(50) = \log(2\cdot 50) = \log(100) = 2$

3. $\log(20) + \log(50) = \log(20\cdot 50) = \log(1000) = 3$

4. $\log(150) \approx 2.1761$

5. No Calc. $\log(3) + \log(50) \approx 2.1761$

$$\boxed{\log_a x + \log_a y = \log(xy)}$$

1. $\log(50) - \log(5) = \log\left(\frac{50}{5}\right) = \log(10) = 1$

2. $\log(3000) - \log(3)$

$$\boxed{\log_a x - \log_a y = \log_a \frac{x}{y}}$$

3. $\log(150) - \log(1.5)$

4. $\log(150)$

5. No Calc $\log(450) - \log(3) \approx 2.1761$

① Compare $\log(100)$ and $\log(100^3)$
2 6

② Compare $\log(1000)$ and $\log(1000^4)$
3 12

③ Compare $\log(2)$ and $\log(2^3)$
0.301 0.903

$$\boxed{\log_a x^n = n \cdot \log_a x}$$

④ $\log(1.78) \approx 0.2504$

⑤ No Calc. $\log(1.78^3) \approx 0.7512$

Expand

$7^x = 47$

$\log_7 47 = x$

① $\log_4 5 \cdot x^3 \cdot y$

$\log_4(5) + \log_4(x^3) + \log_4(y)$

$\log_4(5) + 3 \cdot \log_4 x + \log_4(y)$

Try

$\ln\left(\frac{\sqrt{3x-5}}{7}\right) = \ln\left(\sqrt{3x-5}\right) - \ln(7)$

$\ln\left((3x-5)^{\frac{1}{2}}\right) - \ln(7)$

$\boxed{\frac{1}{2}\ln(3x-5) - \ln(7)}$

Condense

① $\frac{1}{2}\log x + 3\log(x+1) = \log\sqrt{x} + \log(x+1)^3 = \log\left(\sqrt{x}(x+1)^3\right)$

② $2\ln(x+2) - \ln(x) = \ln\left(\frac{(x+2)^2}{x}\right)$

③ $\frac{1}{3}\left[\log_2 x + \log_2(x-4)\right] = \log_2\left(x(x-4)\right)^{1/3}$

$= \log_2\left(\sqrt[3]{x(x-4)}\right)$

Sect. 3.3

9–16 (4), 19, 20, 23–42 (2 easy, 2 hard), 45–62 (2 easy, 2 hard)